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ComEd

May 12, 2000
RA-00-060

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Unit 2
Facility Operating License No. NPF-77
NRC Docket No. STN 50-457

Subject: Submittal of Licensee Event Report Number 2000-002-00

10 CFR 50.73(a) requires a Licensee Event Report (LER) to be submitted within 30 days after discovery of the event. The purpose of this letter is to provide the subject LER in accordance with 10 CFR 50.73(a)(2)(iv) by the required May 15, 2000 submittal date.

Should you have any questions concerning this letter, please contact Mr. T. W. Simpkin, Regulatory Assurance Manager, at (815) 458-2801, extension 2980.

Respectfully,

G K Schwartz for

Timothy J. Tulon
Site Vice President
Braidwood Station

Attachment: Braidwood Station, Unit 2 LER Number 2000-002-00

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Braidwood Station

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NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98
LICENSEE EVENT REPORT (LER)	ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Braidwood, Unit 2	STN 05000457	1 of 5

TITLE (4)
Automatic Reactor Trip on Power Range Neutron Flux High Negative Rate Due to Stationary Gripper Fuse FU15 Failure for Control Rod P10 Causing the Rod to Drop into the Core.

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
04	15	2000	2000	002	00	05	12	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	1
POWER LEVEL (10)	99.9

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(iii)	☐ 73.71(b)
☐ 20.2203(a)(1)	☐ 20.2203(a)(3)(ii)	☒ 50.73(a)(2)(iv)	☐ 73.71(c)
☐ 20.2203(a)(2)(i)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(v)	☐ OTHER
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)	☐ 50.73(a)(2)(vii)	
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(viii)(A)	(Specify in Abstract
☐ 20.2203(a)(2)(iv)	☐ 50.73(a)(2)(i)	☐ 50.73(a)(2)(viii)(B)	below and in Text,
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(ii)	☐ 50.73(a)(2)(x)	NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Terrence W. Simpkin, Regulatory Assurance Manager	(815) 458-2801 x-2980

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	AA	Fuse	Bussmann	Y					
X	AA	Trigger	Gould Shawmut	N					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On 4/15/2000 at 1714 hours, Unit 2 was operating at 99.9 percent power when it experienced a trip on Power Range Neutron Flux High Negative Rate. Following the trip, a low Steam Generator (SG) level Engineered Safety Features (ESF) actuation signal started Auxiliary Feedwater and a high SG level ESF actuation P-14 signal was processed. The rapid power decrease was traced to the failed Stationary Gripper fuse and blown fuse indicator (telltale) for Control Rod P10 causing the rod drop. Troubleshooting verified that circuits were not shorted and had not caused an overcurrent condition. The blown fuse and telltale were removed for analysis and replacements installed. Unit start-up commenced on 4/16/2000 at 0414 hours, but was aborted due to Digital Rod Position Indication problems. The cause of the trip was the opening of fuse FU15 and telltale which led to the rod drop and subsequent high neutron flux negative rate. The fuse was blown due to an indeterminate overcurrent condition believed to be an isolated failure. Analysis revealed that the fuse had apparently failed prior to the trip and that the telltale had been carrying the load current. Thermography scans will be performed as predictive maintenance to look for "hot" telltales indicative of such fuse failures and the circuits will be reviewed to verify the adequacy of design. Because the negative rate trip may not be necessary, possible elimination of this trip will be reviewed. This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv).

A. Plant Conditions Prior to Event:

Unit: Unit 2 Event Date: 4/15/2000 Event Time: 1714 hours

MODE: MODE 1 Reactor Power: 99.9 percent RCS [AB] Temperature: 581 degrees F.
RCS [AB] Pressure: 2237 psig

B. Description of Event:

On 4/15/2000, Unit 2 was operating at 99.9 percent power with no major evolutions in progress. No equipment was inoperable at the beginning of this event that contributed to the event. No power changes or temperature changes had occurred during the shift, and plant conditions were considered to be steady-state. At 1714 hours, Unit 2 received a Power Range Neutron Flux High Negative Rate [JE] trip. Following the unit trip, a low Steam Generator (SG) water level Engineered Safety Features (ESF) actuation signal [JE] was processed starting Auxiliary Feedwater [BA] and a high SG water level ESF actuation P-14 signal [JE] was processed, each due to the transient response of the SGs. Investigation of the trip indicated a possibility of a dropped control rod. The cooling ductwork was removed to gain access to the Control Rod Drive Power Cabinets [AA]. A failed blown fuse indicator (telltale) and Stationary Gripper fuse FU15 were identified for Control Rod P10 in the 2BD Control Rod Drive Power Cabinet. The fuse and telltale were visually inspected but were not removed from the system.

A troubleshooting team consisting of System Engineering (SED) and Instrument Maintenance (IMD) personnel was assembled. WCAP-5360, Westinghouse Corrective Maintenance Guide, was used as the guideline for troubleshooting, and ground checks and resistance checks of all Control Rod Drive Mechanism (CRDM) coils for Control Rod P10 were performed. The test results were all satisfactory and indicate that there were no circuit faults downstream of the blown fuse, which includes all CRDM cabling, connectors, penetrations, and CRDM coils.

Replacements for Fuse FU15 and its respective telltale and the associated return line fuse FU19 and its respective telltale were installed. The Reactor Trip Breakers were then shut and the System Reset switch actuated. All alarm conditions cleared providing partial indication that the associated control circuitry was functioning properly and not causing an overcurrent condition upstream of the fuse. A Unit restart commenced on 4/16/2000 at 0414 hours, but was aborted due to Digital Rod Position Indication problems.

After removal from the circuit, IMD personnel tested the fuses and telltales with a Fluke Digital Multi Meter. Both the FU15 fuse and its associated telltale indicated open. Both the return line FU19 fuse and its associated telltale indicated normal. SED took control of the fuses for performance of a Failure Analysis. The fuses, telltales, and some spares were forwarded to the Production Training Center (PTC) for testing and evaluation. The conclusion reached was that the fuse blew due to an indeterminate overcurrent condition.

This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv), " Any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System."

C. Cause of Event:

The root cause of the dropped Control Rod P10 was a failure of the Stationary Gripper fuse FU15 in combination with the failure of continued operation of the telltale under load. The Stationary Gripper disengaged after a circuit interruption from both the blown fuse and telltale. The fuse blew due to an indeterminate overcurrent condition that was not caused by a detectable circuit anomaly. The telltale appears to have blown at some point in time apart from the fuse failure, which means the telltale was apparently supporting the power being supplied to the Stationary Gripper. This is considered to be an isolated incident.

The ESF actuation signal that initiated Auxiliary Feedwater is associated with the Feedwater [SJ] isolation signal and is expected upon a reactor trip when low SG water level occurs. The ESF actuation P-14 signal was not expected. The SG transient response caused a momentary sensed high water level that initiated the P-14 ESF signal at the appropriate setpoint.

D. Safety Analysis:

The Reactor Trip System responded normally to the high negative flux rate signal tripping the reactor, and the subsequent Engineered Safety Features Actuation System response was normal. Based on the Updated Final Safety Analysis Report, the existing Power Range Neutron Flux High Negative Rate trip provides protection against two or more dropped control rods. Protection against one dropped control rod is not required to prevent the occurrence of Departure from Nucleate Boiling (DNBR). Therefore the safety significance of this event was minimal.

All actions occurred as expected in response to the automatic ESF actuations. By design, the ESF actuation signal that initiated Auxiliary Feedwater was expected to occur. Although the ESF actuation P-14 signal was not expected, the ESF P-14 signal was initiated at the appropriate setpoint and all components functioned as designed.

This event did not result in a Safety System Functional Failure.

E. Corrective Actions:

Troubleshooting of the dropped control rod indication was completed on 4/16/2000. Braidwood Station previously replaced all of the CRDM Head cabling and connectors on both Unit 1 and Unit 2 with medium-temperature cable with stainless-steel connectors. The ground checks and resistance checks verified that the cabling and penetration did not contain a short or a low resistance path to ground.

The fuses and associated telltales were replaced on 4/16/2000. The Stationary Gripper fuses will be replaced during the Unit 2 fall 2000 refueling outage.

The Rod Control System Users Group members were polled regarding use of similar fuses and telltales. The responses received indicate that industry in general uses the same fuses and telltales, and follow or exceed Westinghouse recommendations for replacement. Westinghouse recommends replacement of the Stationary Gripper fuses every other outage and replacement of the Moveable Gripper fuses every five outages. Electrical Maintenance (EMD) personnel perform resistance checks of all fuses every refueling outage. In addition, the Stationary Gripper and Moveable Gripper fuses are replaced every other outage. Therefore, Braidwood Station meets the recommendation for the Stationary Gripper fuses and exceeds the recommendation for the Movable Gripper fuses. Westinghouse is reviewing the basis for the two refueling outage recommendation with the intent of decreasing the replacement frequency.

The preliminary fuse failure analysis was obtained on 5/2/2000. The final fuse failure analysis report will be obtained and additional findings, if any, will be addressed as needed.

A predictive maintenance practice of performing thermography prior to or after control rod motion surveillance would identify a " hot" telltale operating at an elevated temperature. With Westinghouse's recent concurrence that thermography be performed in conjunction with the control rod movement surveillance, the use of quarterly thermography scans in the Control Rod Drive Power Cabinets as predictive maintenance will be implemented.

Braidwood Station currently maintains the Power Range Neutron Flux High Negative Rate trip, which may not be necessary. The possible removal of the existing negative rate trip will be reviewed.

The fuse and telltale circuit design will be reviewed to determine the possibility of using two telltales instead of a single fuse with a single telltale, and possibly increasing the telltale rating to 10 amps similar to that of the fuse. Westinghouse has acknowledged that although the fuse and telltale combination does not utilize the components in a manner recommended by the manufacturers, the combination does provide the desired results for circuit operation.

F. Previous Occurrences:

There have been no previous events at Braidwood Station where a control rod has dropped into the reactor core at power due to a fuse failure. However, fuse failures have occurred after the Control Rod Drive System has been re-energized after refueling outage maintenance, which have averaged one or two blown fuses each outage. The last time a failed fuse was identified was during Unit 1 fall 1998 refueling outage. Plant operators perform a walkdown and visually verify all fuses and telltales prior to performing control rod surveillance testing. Any blown fuses or telltales that are found are replaced prior to attempting control rod withdrawal.

G. **Component Failure Data:**

Manufacturer	Nomenclature	Model
Bussmann	Semiconductor Fuse F16-FU-15	2432B59
Gould Shawmut	Telltale Trigger	TI-600

The evaluation results of the fuses and telltales to date indicate that the fuse blew due to an overcurrent condition, but not a short to ground. The fuses and telltales were x-rayed, resistance tested, and visually inspected under magnification. The blown fuse was cut open identifying three out of seven links had blown with little sand discoloration. Feedback from the fuse manufacturer (Bussmann) indicates the fuse blew between 30 and 40 amps, which is within the normal circuit surge range. Discussion with the manufacturers of both the fuse and the telltale (Gould Shawmut) indicate that the fuse may have been blown first with the telltale holding the control rod (with a reduced stationary current of 4.4 amps).